

# WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

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March 31, 2010

TO: Internal File

THRU: James D. Smith, Permit Supervisor *JS 01 Apr 2010*

FROM: Steve Christensen, Environmental Scientist *SC*

RE: 2009 Third Quarter Water Monitoring, West Ridge Resources, West Ridge Mine,  
Task ID #3395

The West Ridge Mine is currently operational in the Book Cliff Mountain range of Carbon County, UT. Water monitoring data is submitted quarterly to the Division EDI database. Beginning on page 7-34 of the approved Mining and Reclamation Plan (MRP), water monitoring protocols and sampling requirements are provided for surface water, ground water, monitoring wells and UPDES outfalls in Tables 7-1, 7-2, 7-3 and 7-4 respectively.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

## ***Springs***

*The approved MRP outlines the monitoring of 10 springs. Four of the springs (SP-12, SP-13, SP-15 and SP-16) discharge from the lower slopes of West Ridge in Whitmore Canyon. Two springs (WR-1 and WR-2) discharge from the upper slope of West Ridge in Whitmore Canyon. One spring (SP-8) discharges in the upper drainage of C Canyon. Hanging Rock Spring (S-80) is located near the northwest corner of the permit area and discharges from the east slopes of Whitmore Canyon. Spring 101 monitors Little Spring at the bottom of West Ridge. Spring 102 is located within Spring Canyon.*

Data was submitted for all spring monitoring sites with measurable flow.

## ***Streams***

*The approved MRP outlines the monitoring of 12 stream sites. Grassy Trail Creek is the only perennial stream in the permit and adjacent areas. Operational sampling is required quarterly for six stream sites (ST-3, ST-8, ST-9, ST-10, ST-13 and ST-15). Four sites (ST-5, ST-6, ST-6A and ST-7) are equipped with automatic samplers that are required to be checked*

*following precipitations events. Sites ST-11 and ST-12 were added to the water-monitoring program based upon field inspections conducted in 2005. The field inspections were conducted as part of a proposed lease expansion by the Permittee. At the time of the inspections, the Bear Canyon drainage had exhibited measurable flow. As a precaution, sites ST-11 and ST-12 were established within that drainage. Since that time (summer of 2005) neither site has produced appreciable/measurable flow. However, the sites remain as part of the surface water monitoring program and are inspected quarterly.*

Data was submitted for all stream-monitoring sites with measurable flow.

### **Wells**

*Operational sampling is required quarterly for one groundwater monitoring well (Site DH 86-2).*

Monitoring well DH 86-2 was sampled during this quarter and all required data submitted.

### **UPDES**

Operational sampling is required monthly for two active UPDES sites (Permit # UT0025640). Site D001 is the mine sites primary sediment pond discharge to the ephemeral 'C' Canyon drainage. Site D002 is the mine-water discharge to the ephemeral 'C' Canyon drainage. Specific limitations and self-monitoring requirements as outlined in the UPDES permit are presented in the table below:

Effluent Characteristics	Effluent Limitations
Flow, MGD (million gallons per day)	1.0
Total Suspended Solids (TSS), ppm	70
Total Iron, ppm	1.3
Oil & Grease, ppm	10
Total Dissolved Solids (TDS), ppm	2,000
pH	9

The Permittee submitted all required samples per the terms of the UPDES discharge permit.

2. Were all required parameters reported for each site? YES ☒ NO ☐

**Surface Water Monitoring Sites:** All required parameters were reported for sites with

measurable flow.

**Groundwater and Well Monitoring Sites:** All required parameters were reported for sites that measurable flow.

**UPDES:** Site D001 did not produce any discharge during this quarter. All required parameters were reported for Site D002.

**3. Were any irregularities found in the data?** YES ☒ NO ☐

**Surface Water Monitoring Sites-** The following irregularities were found in the reported surface water monitoring data:

**ST-5-** Flow values had been steadily rising at surface water monitoring site ST-5 (See Chart Below). Four of the last six quarters of monitoring have produced flow values outside of two standard deviations from the mean. Based upon field inspections and discussions with the Permittee, it's apparent that the majority (if not all) of the flow within this ephemeral drainage is coming from the mine-water discharge. The 2<sup>nd</sup> quarter of 2009 and now this quarter have reported lower flow values. Based upon discussions with the Permittee, the encountered mine-water underground has been re-routed. In order to facilitate the settling of T-Fe and TSS from the mine-water prior to discharge, the Permittee has routed the water into a mined out section of gob. The re-routing will effectively lengthen the flow path the mine-water must travel prior to discharging. As a result, flow values have been reduced.

As the flow is generated from the mine-water discharge, particular attention has been paid to the TSS and T-Fe values. As discussed in detail below (UPDES Section), these two parameters have shown significant upward trends within the mine-water discharge. The reported TSS and T-Fe values for this quarter continue that upward trend (See Charts Below).

The reported T-Fe value for site ST-5 this quarter is 1.268 ppm. Though this value is within two standard deviations of the mean, it is very close to the UPDES discharge permit limit of 1.3 ppm for T-Fe. It appears that the elevated T-Fe concentrations in the mine-water discharge are not isolated to the outlet of UPDES outfall D002.

The reported TSS value for site ST-5 this quarter is 29 ppm. TSS concentrations (like T-Fe) are producing a significant upward trend. However, the TSS values are well within the 70 ppm water quality standard established in the UPDES discharge permit.

**ST-6-** As with site ST-5, the majority (if not all) of the flow within this drainage comes from the mine-water discharge. Two of the last three quarters had reported increased flow values outside of two standard deviations from the data set.

The reported flow value for this quarter was significantly lower at 134.64 gpm. This value represents the lowest flow value at site ST-6 since August 11<sup>th</sup>, 2004. As with Site ST-5 (See Discussion Above), the re-routing of mine-water has produced a reduction in flow measured at site ST-6 (directly below UPDES outfall D002).

Again, as with site ST-5, as the TSS and T-Fe levels in the mine-water have steadily increased, particular attention has been paid on potential downstream impacts as a result. Site ST-6 is located less than ½ mile from the outlet of UPDES outfall D002 (mine-water discharge point) and as result, there is a potential for increased TSS and T-Fe levels.

T-Fe levels have increased steadily at site ST-6 since approximately the 2<sup>nd</sup> quarter of 2008. The reported T-Fe concentration this quarter was 1.112 ppm. This value is within two standard deviations of the mean and within the 1.3 ppm water quality standard. However, it does represent the fourth out of the last five consecutive quarters with reported T-Fe values above 1.0 ppm.

TSS levels have also steadily increased. This quarter reported a TSS value of 40 ppm, which is the fifth consecutive quarter of increasing TSS concentrations at ST-6. Though well below the 70 ppm water quality standard established in the UPDES discharge permit, it does appear that the increased TSS levels in the mine-water discharge (UPDES Discharge Outfall D002) are not isolated, but rather producing measurable increases downstream. Continued monitoring will be conducted.

**ST-5 and ST-6-** The flow's at these two sites are producing very similar trends. These trends provide further evidence that the flow within these two drainages is primarily from mine-water discharge. (See Charts Below).

**ST-10-** Several parameters were reported outside two standard deviations during the third quarter of 2008. TSS, TDS, Cat-An PC Diff, and T-Fe values were significantly higher. Based upon rainfall data, it appeared that the elevated levels were caused by a large rainfall event prior to sampling. However, no flow was reported at monitoring site ST-10 during both the 4<sup>th</sup> quarter of 2008 and the 1<sup>st</sup> quarter of 2009. As such, it was unknown as to whether the rainfall event had caused the elevated samples.

The sampling data reported for this quarter represents the second consecutive quarter (including the 2<sup>nd</sup> quarter of 2009) where all required parameters were within two standard deviations from the mean. It would appear that a rainfall event caused a flushing event that resulted in the elevated concentrations during the third quarter of 2008.

**Groundwater Monitoring Sites-** Several irregularities were found in the reported groundwater monitoring data:

**SP-101-** This spring has begun to exhibit upward trends in several parameters. During the 4<sup>th</sup> quarter of 2008 the reported dissolved magnesium (D-Mg) value was 2.33 standard deviations from the mean with a reported value of 54.74 ppm. Upon review of the sampling data during the 2<sup>nd</sup> quarter of 2009, it appears that D-Mg is beginning to exhibit an upward trend. In addition, several parameters were reported outside two standard deviations from the data set during the 2<sup>nd</sup> quarter of 2009 sampling (D-Mg, Cat-Ani PC Difference, T-Hardness and T-Cations). Several parameters were again reported outside of two deviations this quarter: water temperature, total alkalinity and bicarbonate.

**SP-102-** Two reported values were outside of two standard deviations from the mean: water temperature and bicarbonate. It is the second consecutive quarter where bicarbonate has been reported outside of two standard deviations. Continued monitoring of spring SP-102 will be conducted in order to detect if any significant trends are developing.

**SP-12-** Sampling was not possible the previous quarter (1<sup>st</sup> quarter 2009) due to accessibility issues due to snow/mud. The second quarter's sampling from 2009 reported several parameters outside of two standard deviations: D-Ca, D-Na, SO<sub>4</sub>, L-Sp. Cond, TDS, Bcrb and Total Cations.

D-Na, L-Sp. Cond and TDS were again reported outside of two standard deviations. The increase in TDS is producing increases in its components. Based upon the data set, TDS has been steadily trending upward since monitoring began in 2000.

**SP-13-** Two parameters were reported outside two standard deviations from the data set during the 4<sup>th</sup> quarter of 2008 (D-Mg and T-Hdns). Due to weather conditions, the site was inaccessible during the 1<sup>st</sup> quarter of 2009. The second quarter's sampling from 2009 reported a value for D-Na that was out by 2.18 standard deviations.

Water temperature and D-Na were reported outside of two standard deviations for this quarter. As with SP-13, it appears that as TDS has been steadily increasing, so have associated components of dissolved constituents. (See Chart Below).

**SP-8** Several parameters were reported out of two standard deviations from the data set during the 2<sup>nd</sup> quarter of 2009: Cation-Anion PC Diff, D-Na and TDS.

D-Na, T-alkalinity and T-Cats were reported outside of two standard deviations from the mean during this quarters sampling.

**WR-1** reported three parameters beyond two standard deviations from the mean: T-Mn, water temperature and T-Fe. Based upon discussions with the Permittee, an inadvertent introduction of sediment in the sample may have caused the elevated readings. Continued monitoring will determine if that was the case.

**WR-2** had reported an elevated concentration of D-Na beyond two STD during the 2<sup>nd</sup> quarter of 2008 (33.77 ppm). The spring did not produce a measurable flow during the 3<sup>rd</sup> and 4<sup>th</sup> quarters of 2008. The site was inaccessible during the 1<sup>st</sup> quarter of 2009 due to weather conditions. No observable flow was reported for the second quarter of 2009 and again for this quarter. As such, it's uncertain as to what may have caused the elevated D-Na concentrations at this monitoring point. Continued monitoring of the site will be conducted.

**Monitoring Well DH 86-2** reported three values outside two standard deviations during the 2<sup>nd</sup> quarter of 2009: D-Ca, Cl and Total Cations. Several parameters were reported outside of two deviations for this quarter: D-K, Cl, T-Cats and T-Anions.

#### **UPDES Sites- (UPDES Permit #UT0025640)**

**Site D001-** UPDES outfall D001 (primary sediment pond at mine site) did not discharge this quarter.

**Site D002-** UPDES Outfall 002 has exhibited fluctuating levels of TSS and T-Fe historically (See Charts below).

During the 1<sup>st</sup> quarter of 2008, a TSS value of 103 ppm was reported for D002, which exceeded the 70 ppm standard established in the Permittee's UPDES Discharge Permit (# UT0025640). However, for the next 3 consecutive quarters (2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> quarters of 2008), the TSS levels were within the 70 ppm compliance level.

In the 1<sup>st</sup> quarter of 2009, the mine-water discharge at site D002 produced a TSS value outside of two standard deviations from the mean. However, that value (53 ppm) was within the 70-ppm compliance level. Out of 4 sampling events during the 2<sup>nd</sup> quarter of 2009, one TSS value was reported above the 70-ppm compliance levels (82 ppm). Outfall 002 was sampled 6 times during this quarter. All six samples reported TSS levels well below the 70 ppm compliance level.

T-Fe at outfall D002 has exhibited similar erratic trends (See Chart Below). T-Fe levels were particularly high during most of 2007 with a maximum reported value of 2.682 ppm. For 2008, T-Fe levels essentially stayed within the compliance level of 1.3 ppm as outlined in the UPDES Discharge Permit.

However, during the 1<sup>st</sup> quarter of 2009, the standard for T-Fe (1.3 ppm) was exceeded

three times out of six sampling events (1.423 ppm, 1.478 ppm and 1.824 ppm). Based on six sampling events for the 2<sup>nd</sup> quarter of 2009, reported T-Fe levels exceeded the 1.3 ppm standard four times (1.629 ppm, 2.07 ppm, 1.32 ppm and 1.934 ppm).

Outfall 002 was sampled 6 times during this quarter. Of the six samples, one was reported out of compliance with a concentration of 1.699 ppm.

The Permittee notified the Division in January of 2009 to report that coal fines had been accumulating within the C Canyon drainage as a result of the mine-water discharge. On January 1<sup>st</sup>, 2009, Division Inspector Steve Demczak issued a Notice of Violation (#10033) for "additional contributions of sediment to stream flow outside the permit area".

Additionally, on February 10<sup>th</sup>, 2009 (WQ09-1), the Division of Water Quality (DWQ) issued a violation for not meeting compliance levels for TSS and T-Fe at outfall D002 (mine-water discharge point).

On March 30<sup>th</sup>, 2009, the Permittee submitted a 'Mitigation and Abatement Plan' that outlined the methods to remove the coal fine material from the 'C' Canyon Drainage as well as address the underground conditions and water management within the mine works (Task ID #3257). The Division reviewed the proposed amendment and found deficiencies that needed to be addressed. The amendment was returned deficient. On June 8<sup>th</sup>, 2009, the Permittee re-submitted the proposed amendment for technical review. The Division reviewed the re-submitted amendment (Task ID #3309) and identified outstanding deficiencies. A deficiency letter was sent to the Permittee on July 28<sup>th</sup>, 2009.

The Permittee has modified the routing and treatment of the mine-water underground. A flocculent has been utilized on the mine-water prior to its discharge at Outfall 002. In addition, a series of catch basins were constructed within the C Canyon Drainage. In July of this quarter, the Permittee initiated clean-up efforts of the coal fines within the stream channel. The Permittee was successful in dislodging the material and removing it from the catch basins. Approximately 300 tons of material was removed from the drainage. As a result, Notice of Violation #10033 was terminated on August 26<sup>th</sup>, 2009. The permitting process will continue on the catch basins, as it was the general consensus of the regulatory agencies that the basins remain in place during active operations at the mine.

#### **4. On what date does the MRP require a five-year re-sampling of baseline water data.**

On page 7-35 of the approved MRP, the Permittee commits to collecting baseline samples *"from each spring in the monitoring program during the low flow (fall) sampling and from each stream monitoring sites during low flow every five years beginning with the first mid-term review."*

The Division initiated the last mid-term review on November 9<sup>th</sup>, 2006. As such, baseline sampling of ground and surface water sites will be required during the 3<sup>rd</sup> quarter of 2011.

**5. Based on your review, what further actions, if any, do you recommend?**

Continue to monitor the data irregularities cited above for any trends.

**6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements?**

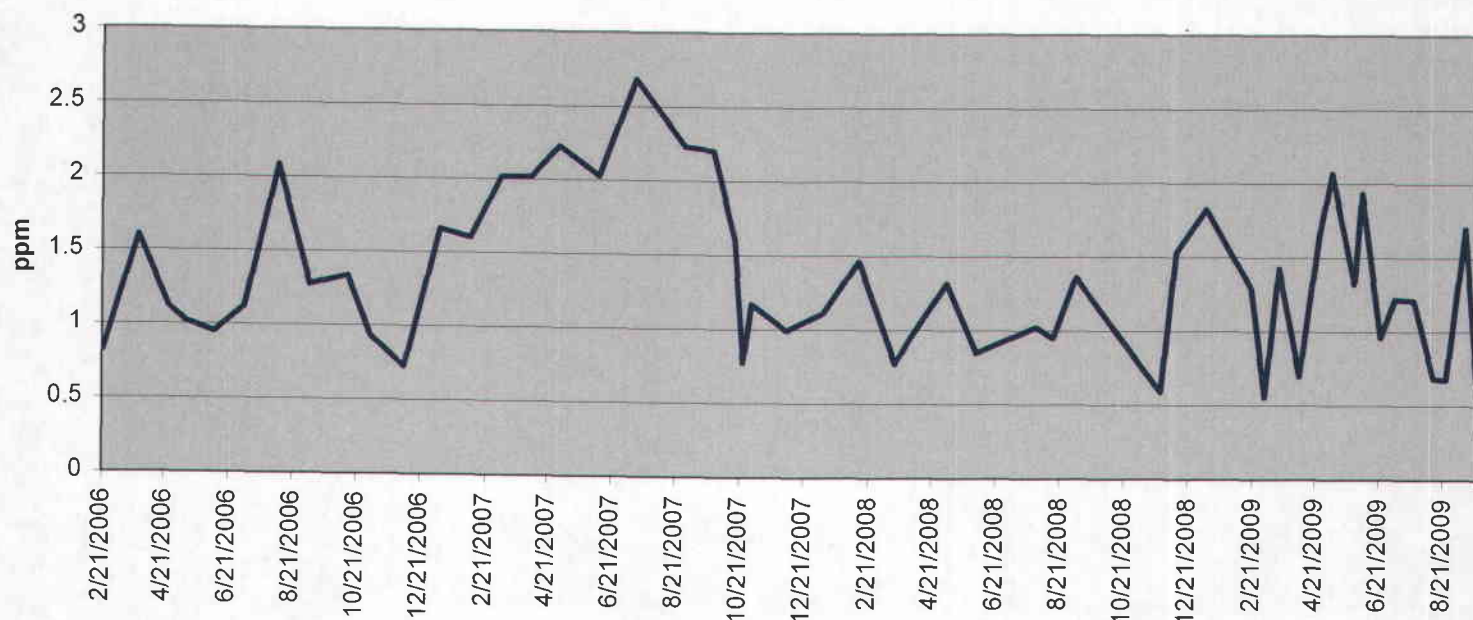
YES ☐ NO ☒

**7. Follow-up from last quarter, if necessary. Did the Mine operator submit or provide an explanation for missing and/or irregular data?**

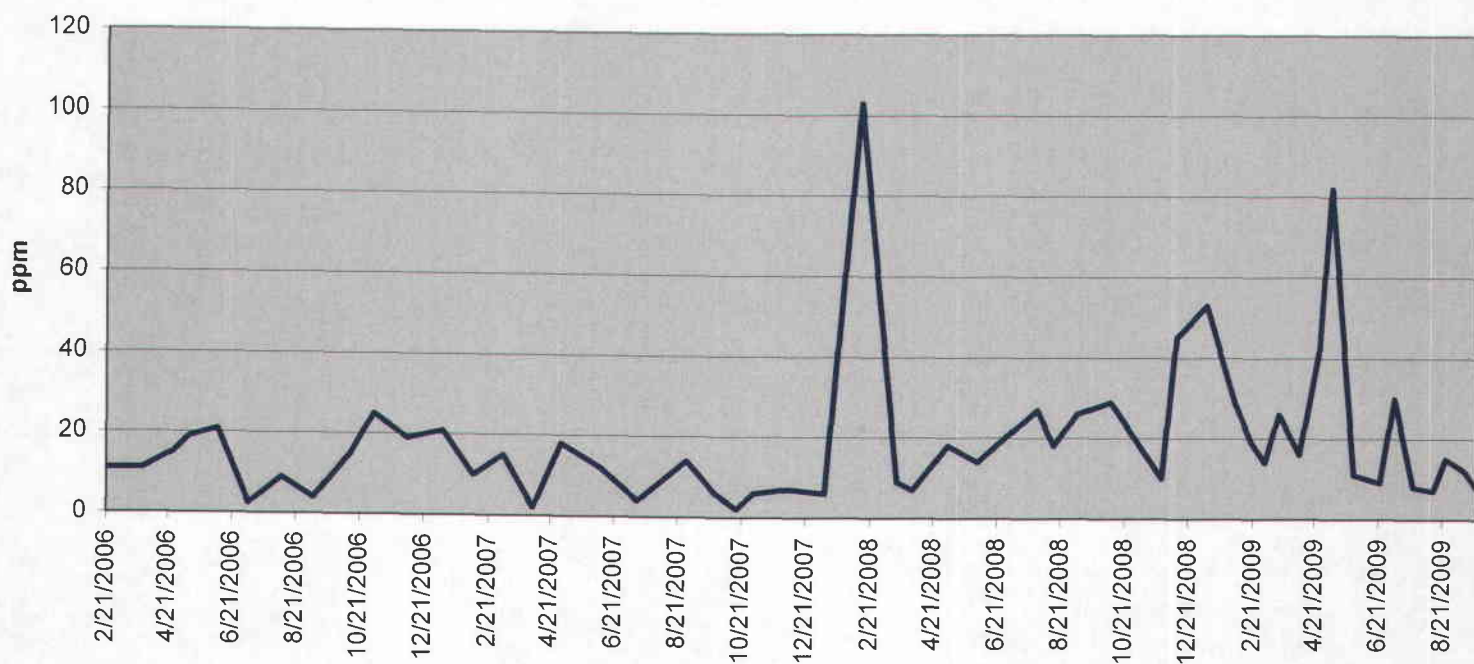
YES ☐ NO ☒



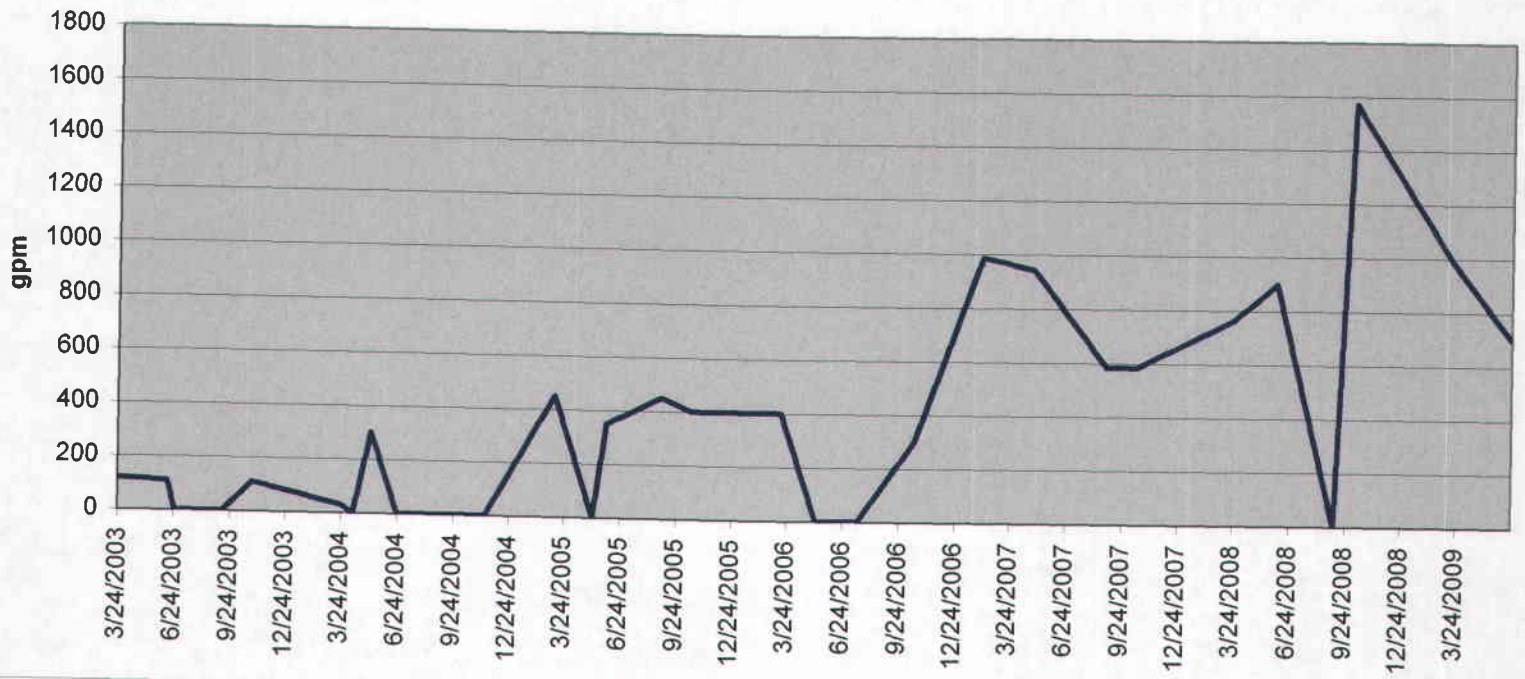
**UPDES Outfall DOO2: Total Iron (T-Fe) vs. Time**



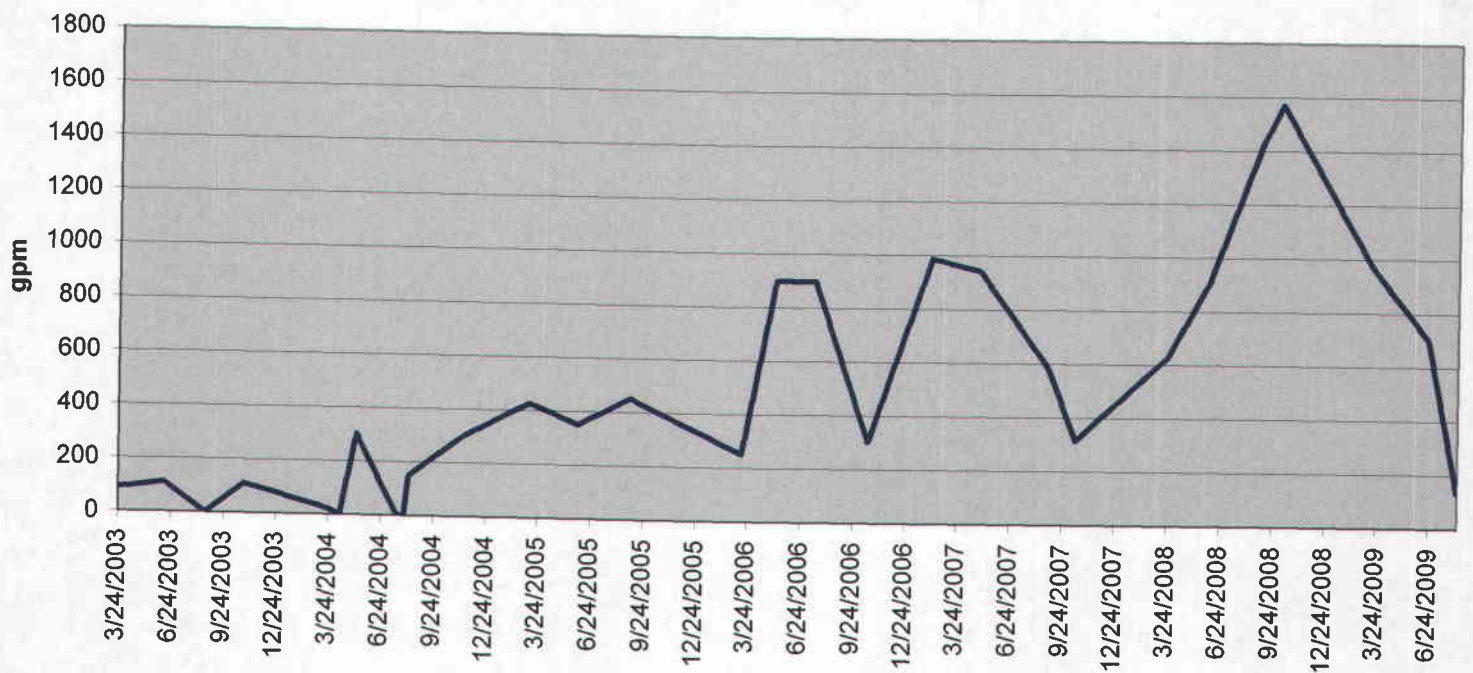
**UPDES Outfall D002: TSS vs. Time**



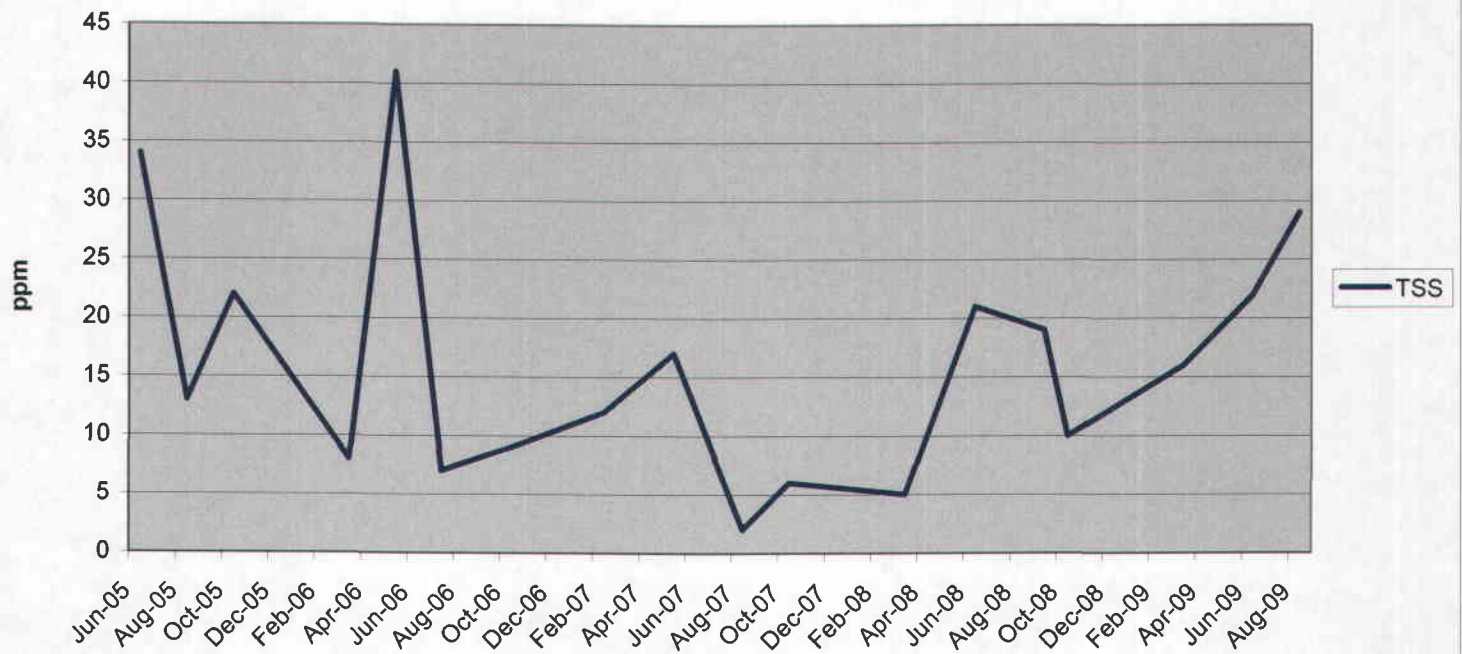
**ST-5: Flow Values**



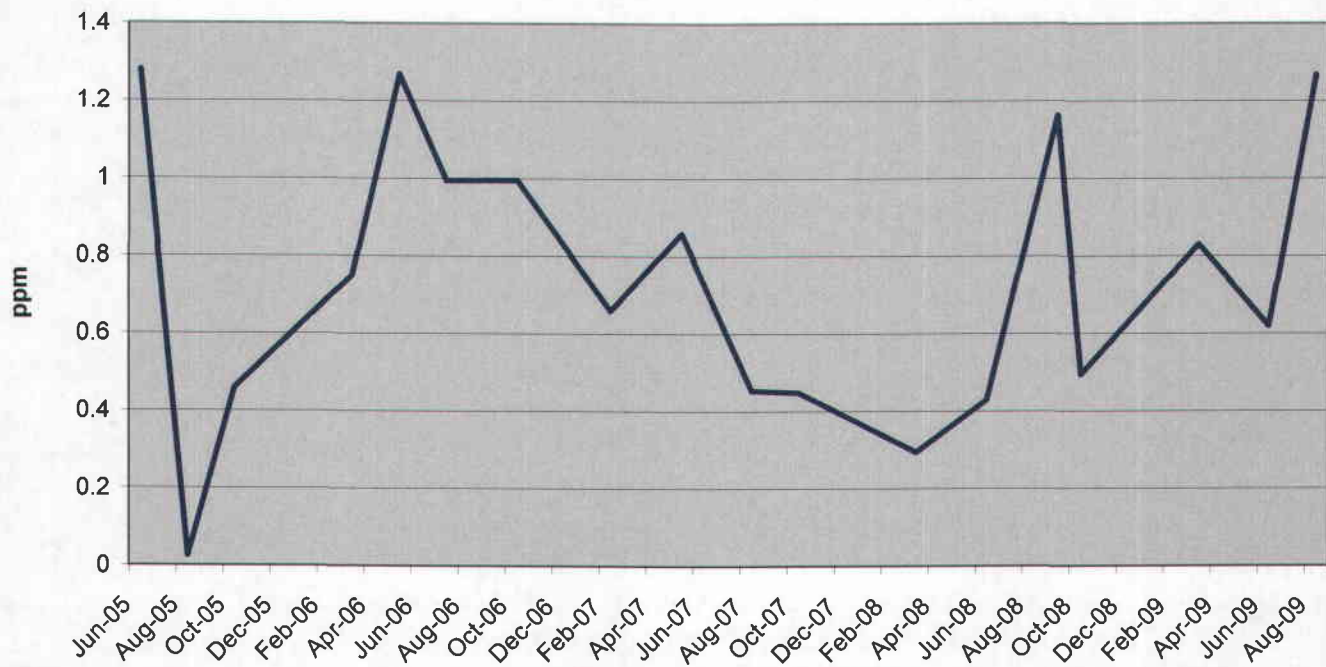
**ST-6: Flow Values**



**ST-5: TSS vs. Time**

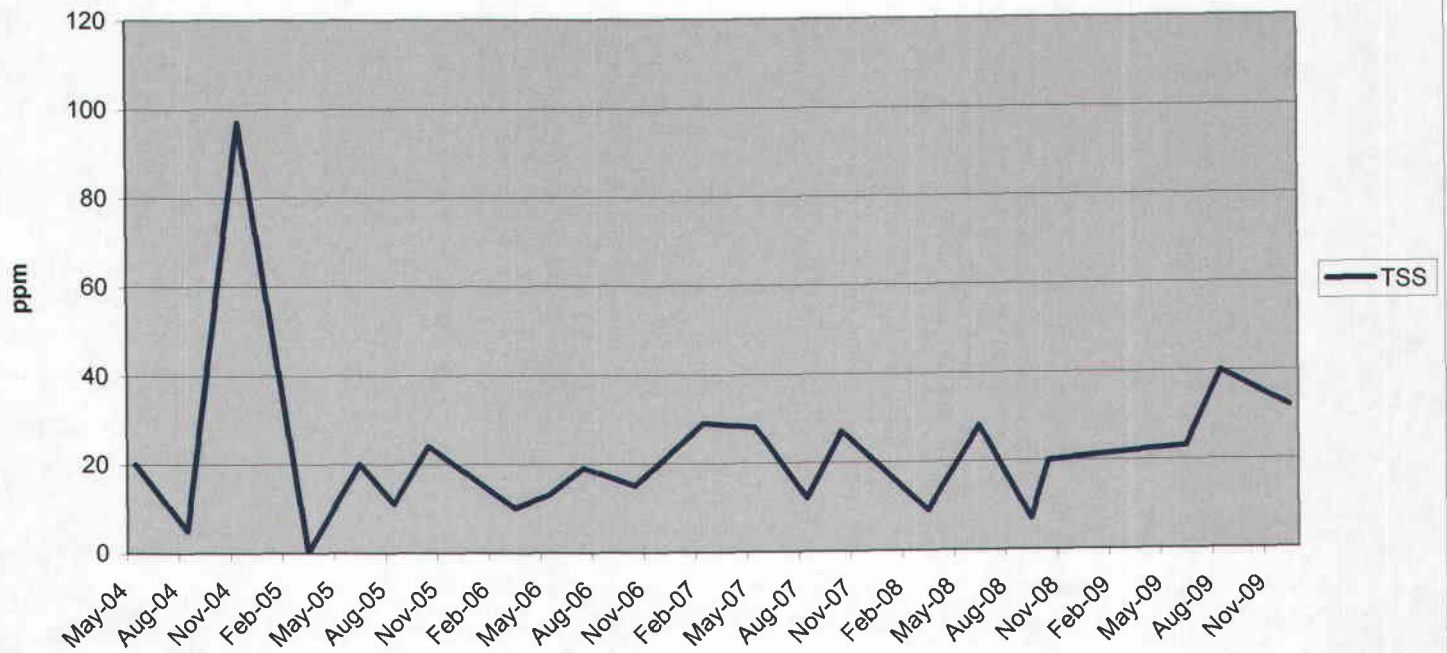


**ST-5: T-Fe vs. Time**

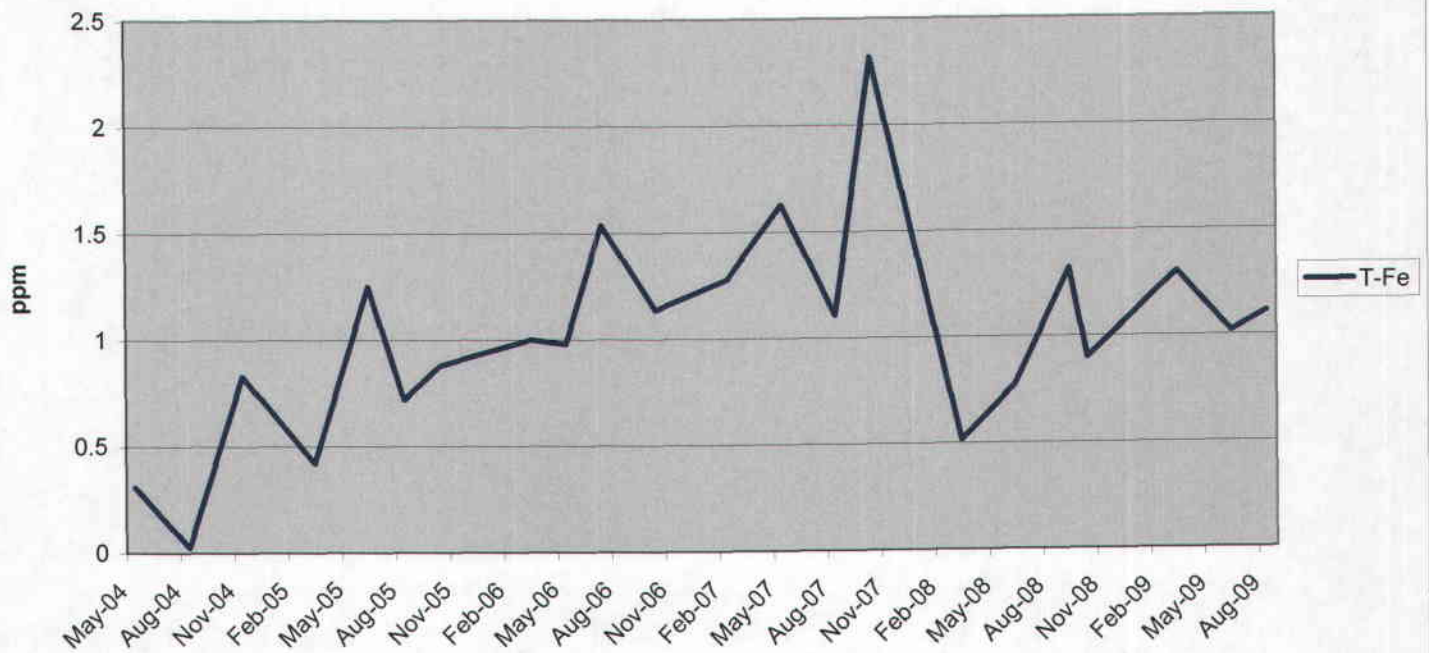




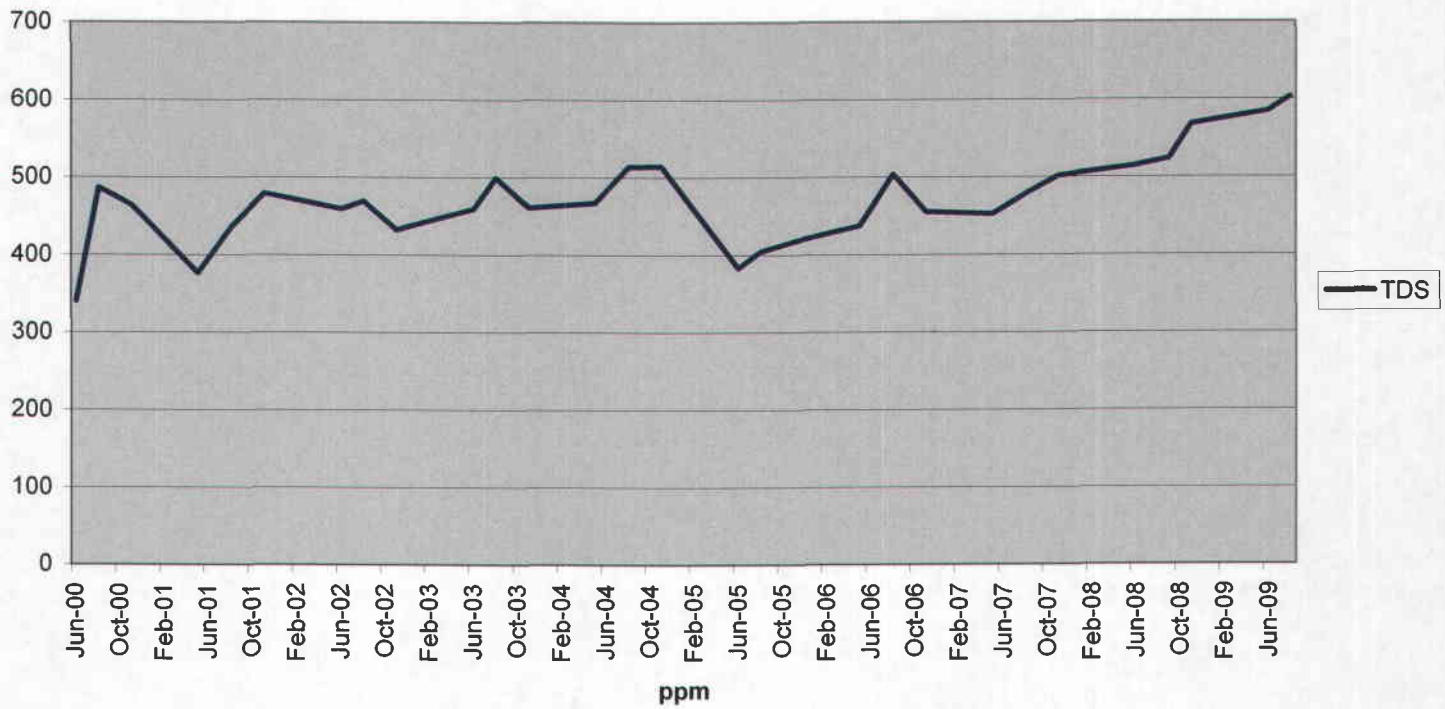
**ST-6: TSS vs. Time**



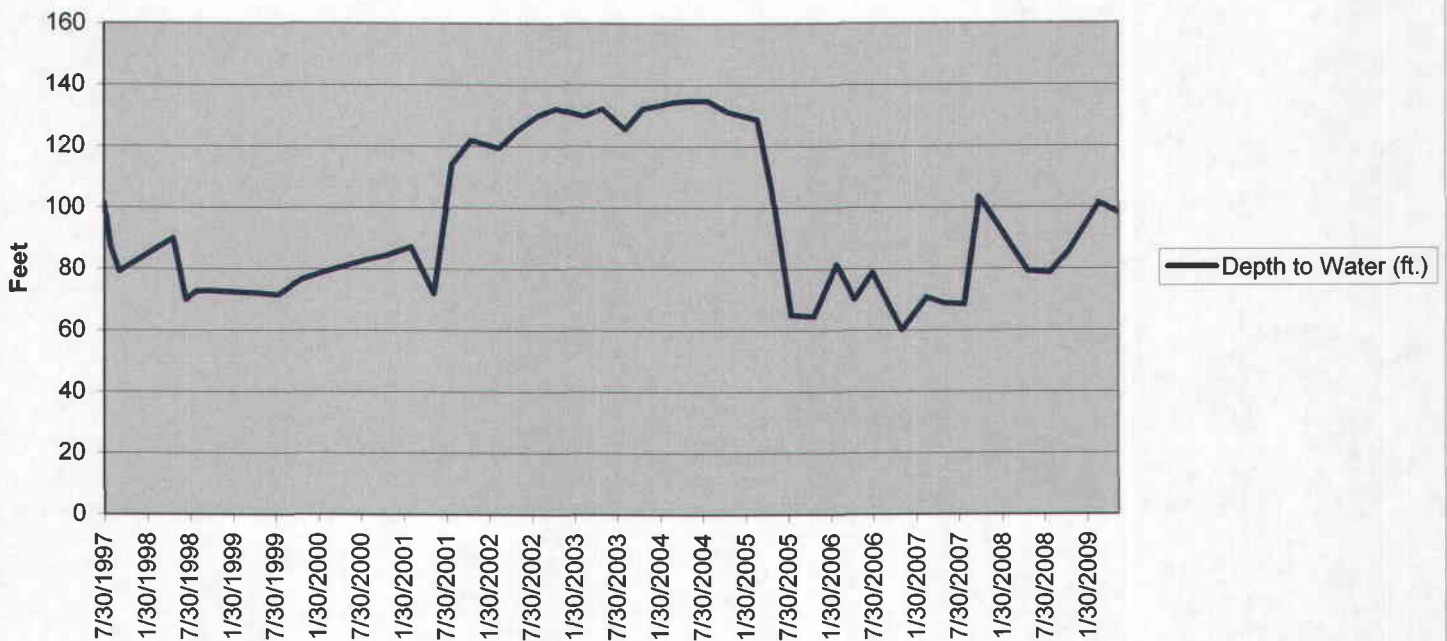
**ST-6: T-Fe vs. Time**



**Spring SP-12: TDS vs. Time**



**Well DH 86-2**



Spring SP-13: TDS, SO4 vs. Time

